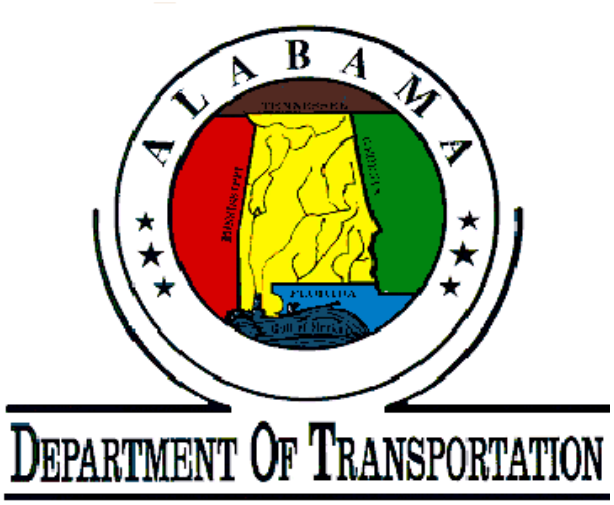
August 2005 through October 2005 STATUS REPORT

VOLUME I OF II: REPORT

COLISEUM BOULEVARD PLUME INVESTIGATION



January 10, 2006

Submitted to:
The Alabama Department of Environmental Management
Montgomery, Alabama

August 2005 through October 2005 Status Report

Coliseum Boulevard Plume Investigation

Table of Contents

Tables continued…

Plate

Attachments

August 2005 through October 2005
Status Report

Summary

During the period between August 1, 2005, and October 31, 2005, investigations at the Coliseum Boulevard Plume (CBP) site continued.

- Annual monitoring of all ground-water monitoring wells and selected continuous multi-channel tubing (CMT) wells, the Kilby Ditch and the "Low-Lying Area" were conducted in October 2005 in accordance with the approved plans and are summarized in Section I. This report contains results of samples collected through October 31, 2005.
- Additional site-wide investigations continued around the perimeter of the investigation area and included ground-water sampling at select locations as outlined in Addendum 14 – Additional Site-Wide Investigations.

Section I of this report contains information regarding routine monitoring completed by October 31, 2005.

Section II of this report contains information regarding additional site-wide investigations completed by October 31, 2005.

Section III contains information about the investigation derived waste and treated water generated during this period.

Section IV contains a summary of quality assurance/quality control (QA/QC) samples collected during this period.

I. Routine Monitoring

Water Level Measurements

- October 3 through October 5, 2005: Depths to ground water were measured in piezometers, monitoring wells, CMT wells, and pump test wells associated with the Coliseum Boulevard Plume Investigation. Ground-water elevations on October 3 through October 5, 2005, are provided in Tables 1a through 1f. Ground-water elevations on October 3 through October 5, 2005, in the 100- and 200-series "shallow zone" monitoring wells and piezometers are shown on Figures 1 and 2, respectively.

  Depths to ground water were measured in continuous multi-channel tubing (CMT) wells 1 through 7 (see Table 2) on October 3 through October 5, 2005. The water levels were not measured in CMT 1-7, CMT 3-7 and CMT 4-7 on October 3 through October 5, 2005, because of an obstruction in the well ports that prevented the water level indicator cable from freely advancing through the ports.

Annual Sampling Event (Modification to Addendum 13 Work Plan)

On March 17, 2005, a modified work plan (Modification to Addendum 13) was submitted to the Alabama Department of Environmental Management (ADEM) to modify the ground-water sampling program based on review of analytical data from each sampling event conducted. Specifically, upward and downward trends and seasonal variations in volatile organic compounds (VOCs) detected in the samples along with special and temporal variation in other parameters such as inorganics (nitrate, nitrite, sulfate, chlorides, alkalinity) and dissolved gasses (methane, ethane, ethane) were evaluated. The modified monitoring program is outlined as follows:

- New wells will be sampled quarterly for a minimum of one year. After one year, data collected from new wells will be evaluated as follows to determine sampling frequency.
- If there is a significant (increasing or decreasing) trend in TCE concentrations for samples collected from at least one well in a cluster/nest the sampling frequency will be quarterly.
- If there are detectable levels of TCE but no clear trend, the sampling frequency will be semi-annual.
- If TCE concentrations in ground-water samples from all wells in a cluster are below detectable levels, the sampling frequency is annual. Deep zone wells (300-series) will be sampled annually, with the exception of monitoring well MW-341.
- Natural attenuation parameters (inorganics and dissolved gasses) will be analyzed in new wells for four quarters.

- The parameters of turbidity, dissolved oxygen, conductivity, oxidation-reduction potential, and pH will continue to be monitored at all wells during purging.
- Semi-annual and annual sampling events will be staggered to account for seasonal variability.
- Continuous multi-channel tubing (CMT) wells CMT-5, CMT-6, and CMT-7, and monitoring wells MW-148A, MW-248B, and MW248C were installed as observation wells for aquifer pump tests, and are in close proximity to other monitoring wells. Therefore, these wells will not be sampled.

The sampling event conducted in October 2005 comprised an annual event which included sampling all monitoring wells at the Coliseum Boulevard Plume site.

- October 3 through October 25, 2005: During the annual event of the approved monitoring program, ground-water samples were collected from 101 of the 102 monitoring wells located at the Coliseum Boulevard Plume site. Monitoring well MW-214 did not contain a sufficient quantity of ground-water for sampling on October 14, 2005. Monitoring well MW-214A located adjacent to MW-214 was, however,sampled during this event. Groundwater samples collected from the 101 monitoring wells sampled were analyzed for VOCs by **TTL**'s laboratory using EPA Method 8260. The ground-water samples were measured in the field for ferrous iron and total iron using a CHEMetrics VVR photometer®.

  In addition, samples were also collected from new monitoring wells MW-143A, MW-243B, MW-144A, MW-244B, MW-244C, MW-145A, MW-146A, MW-246B, MW-147A, MW-247B, MW-149A, MW-249B, MW-249C, MW-150A, MW-250B, MW-250C, MW-151A, MW-251B, MW-152A, and MW-252B for analysis of inorganics (total alkalinity, chloride, nitrate, nitrite, and sulfate) by **TTL**'s laboratory and for dissolved gases (methane, ethane and ethene) by STL in Burlington, Vermont, as outlined in the sampling procedures of the modified Addendum 13 Work Plan.

  The results of the analyses of detected VOCs in the ground-water samples collected from the monitoring wells are provided in Table 3. The results of the analyses for total alkalinity, chloride, nitrate, nitrite, sulfate, ferrous and total iron, methane, ethane, and ethene in the ground-water samples collected from the approved monitoring wells under the Modification to Addendum 13 are provided in Table 4. The concentrations of detected VOCs in ground-water samples collected from the monitoring wells are shown on Plate 1 and Figure 3. Laboratory reports of the results of the analyses of the ground-water samples collected during the month of October 2005 are provided on the attached compact disc - recordable (CD-R).

Prior to sample collection, the monitoring wells were purged using a bladder pump until field parameters (pH, conductivity, and turbidity) stabilized. Temperature and redox (ORP) were also measured in the field. The field parameter measurements during purging of the monitoring wells in the month of October 2005 are provided on the Monitoring Well Sampling Forms on the attached CD-R.

- October 10, 13, 17 and 18, 2005: Ground-water samples were collected from 10 monitoring wells (MW-106, MW-107, MW-130, MW-131, MW-206, MW-207, MW-223, MW-225, MW-230, and MW-231) and analyzed for total organic carbon (TOC). The results of these analyses are provided in Table 5. Laboratory reports of the results of the analyses for TOC in the ground-water samples collected during the month of October 2005 are provided on the attached CD-R.

Quarterly Sampling of the Continuous Multi-Channel Tubing (CMT) Wells

- October 19 though October 26, 2005: Ground-water samples were collected from CMT wells 1, 2, 3 and 4. Each CMT well has seven sampling ports. Ground-water samples were not collected from CMT port 3-1 (on 10/21/05), CMT port 1-4 (on 10/24/05) and CMT port 4-1 (on 10/25/05) due to insufficient groundwater in the CMT ports. After measuring depths to water, each port was purged using a peristaltic pump until field parameters (pH, conductivity, and turbidity) stabilized. Ground-water samples also were measured in the field for temperature, oxidation-reduction potential [redox (ORP)], ferrous [Fe (II)] and total iron. Approximately 2 to 6 gallons of water were removed from each of the CMT ports prior to sample collection. During sample collection, the tubing from the pump was disconnected and withdrawn from the port.

  The ground-water water samples were collected by draining the water from the bottom end of the tubing (end previously inside the port) into the sample containers. The ground-water samples were analyzed for VOCs by **TTL**'s laboratory. Results of analyses of detected VOCs in the ground-water samples collected from the CMT wells are provided in Table 6. Samples for total iron analyses were collected from CMT ports 1-1, 1-5, 2-5, 3-4, and 3-6 on October 19 through October 24, 2005, for quality assurance/ quality control purposes. The results of the analyses for ferrous and total iron are provided in Table 7. Laboratory reports of these analyses and copies of Monitoring Well Sampling Forms are provided on the attached CD-R.

Surface Water Sampling

- October 13 through 14, 2005: Surface water samples were collected from the west and main branches of Kilby Ditch at five locations (compliance points CP-1, CP-2, CP-3, and monitoring points MP-1 and MP-2) and from one location east of the Montgomery Zoo (ZD-1). On October 13 through 14, 2005, the surface water samples were collected at each location from the central part of each ditch. Figure 4 shows the locations of the five sampling points along the Kilby Ditch and the location of the one sampling point along the Zoo Ditch. The water samples were placed on ice and transported to **TTL**'s laboratory for analyses for VOCs. Results of analyses of detected VOCs are provided in Table 8. The laboratory reports for the VOC analyses of the surface water samples collected on October 13 through 14, 2005, are provided on the attached CD-R. During sample collection, the water samples also were measured for temperature, pH, conductivity, dissolved oxygen, and turbidity (see Table 9).

  On October 13, 2005, compliance point surface water samples CP-1, CP-2, and CP-3 contained 3.2J µg/L (micrograms per liter), 8.0J µg/L, and 4.9J µg/L of trichloroethylene (TCE), respectively. The J-flag associated with the concentration means the concentration is below the practical quantitation level. The TCE concentrations detected in the samples collected from CP-1, CP-2 and CP-3 on October 13, 2005, are below the action level concentration of 175 µg/L for TCE in surface water.

  Surface water samples at locations MP-1 and MP-2 contained TCE concentrations of 7.8J µg/L and 20.7 µg/L, respectively, and cis-1,2-dichloroethene at concentrations of 1.4J µg/L and 1.8J µg/L, respectively, on October 13, 2005. There also was detection of chloroform in samples collected from sampling points MP-1 and MP-2 at concentrations of 4.9J µg/L and 1.2J µg/L, respectively, on October 13, 2005.

  On October 14, 2005, the Zoo Ditch surface water sample ZD-1 contained 6.5J µg/L of chloroform.

Low – Lying Area (Addendum 04 Work Plan)

- October 27, 2005: On October 27, 2005, soil/sediment and surface-water samples were collected from locations N, O, and P in the "Low-Lying Area". Results of the analyses for VOCs in the soil/sediment and surface water samples collected from locations N, O, and P on October 27, 2005, are provided in Tables 10 and 11, respectively. Laboratory reports of these analyses are provided on the attached CD-R.

II. Additional Site-Wide Investigation

- August 2 through August 5, 2005: As a part of investigation activities approved under Addendum 14, submitted to the ADEM on February 13, 2004, four piezometers (PZ-18 through PZ-21) were installed southwest of the subject site (see Figure 7) beyond the boundaries of the TCE plume for the purpose of monitoring ground-water elevations down-gradient of the plume. Piezometer PZ-18 was installed in a City of Montgomery street (western terminus of Amanda Lane). Piezometers PZ-19 through PZ-20 were installed on property owned by North Montgomery Materials, LLC, west of Amanda Lane. Piezometer PZ-21 was installed on property owned by Asphalt Contractors Incorporated, also located west of Amanda Lane. The piezometers were installed using Roto-Sonic drilling methods and range in total depth from 63.5 to 71 feet below land surface. The construction characteristics of each piezometer are included in Table 15 and copies of the boring logs for the piezometers are provided on the attached CD-R.

- August 8 through August 9 and October 17 through October 20, 2005: As a part of investigation activities approved under Addendum 14, submitted to the ADEM on February 13, 2004, 8 probeholes (identified as PH147 through PH154) were installed in selected areas around the perimeter of the investigation area (see Figure 7) to further delineate the outermost boundaries of the TCE plume. Ground-water samples were collected from probeholes PH 147 through PH 154, and were analyzed for VOCs (see Table 12 for analytical results and sample intervals). Probeholes PZ-22 and PZ-23 were advanced on October 20, 2005, for the purpose of characterizing the stratigraphy beyond the northern boundary of the TCE plume (see Figure 7). No groundwater samples were collected from the PZ-22 and PZ-23 probehole locations. Laboratory reports of the analyses performed on groundwater samples collected from PH-147 through PH-154 and copies of the soil conductivity and boring logs for all probeholes are provided on the attached CD-R. Soil conductivity was not performed at probehole PH-149 due to an equipment malfunction.

III. Investigation Derived Waste

Water Treatment

- August 3, September 7, October 17, and October 31, 2005: Water accumulated during cleaning of sampling equipment, and purging and sampling of monitoring wells, was treated through a liquid-phase carbon filter treatment system at the ALDOT staging area. A total of 3,257 gallons of water was treated between August 3 and October 31, 2005 (see Table 13). The treated water was discharged into the sanitary sewer at the staging area. During treatment of the water, samples were collected from water discharged from the first carbon filter to monitor for breakthrough and from the second carbon filter to

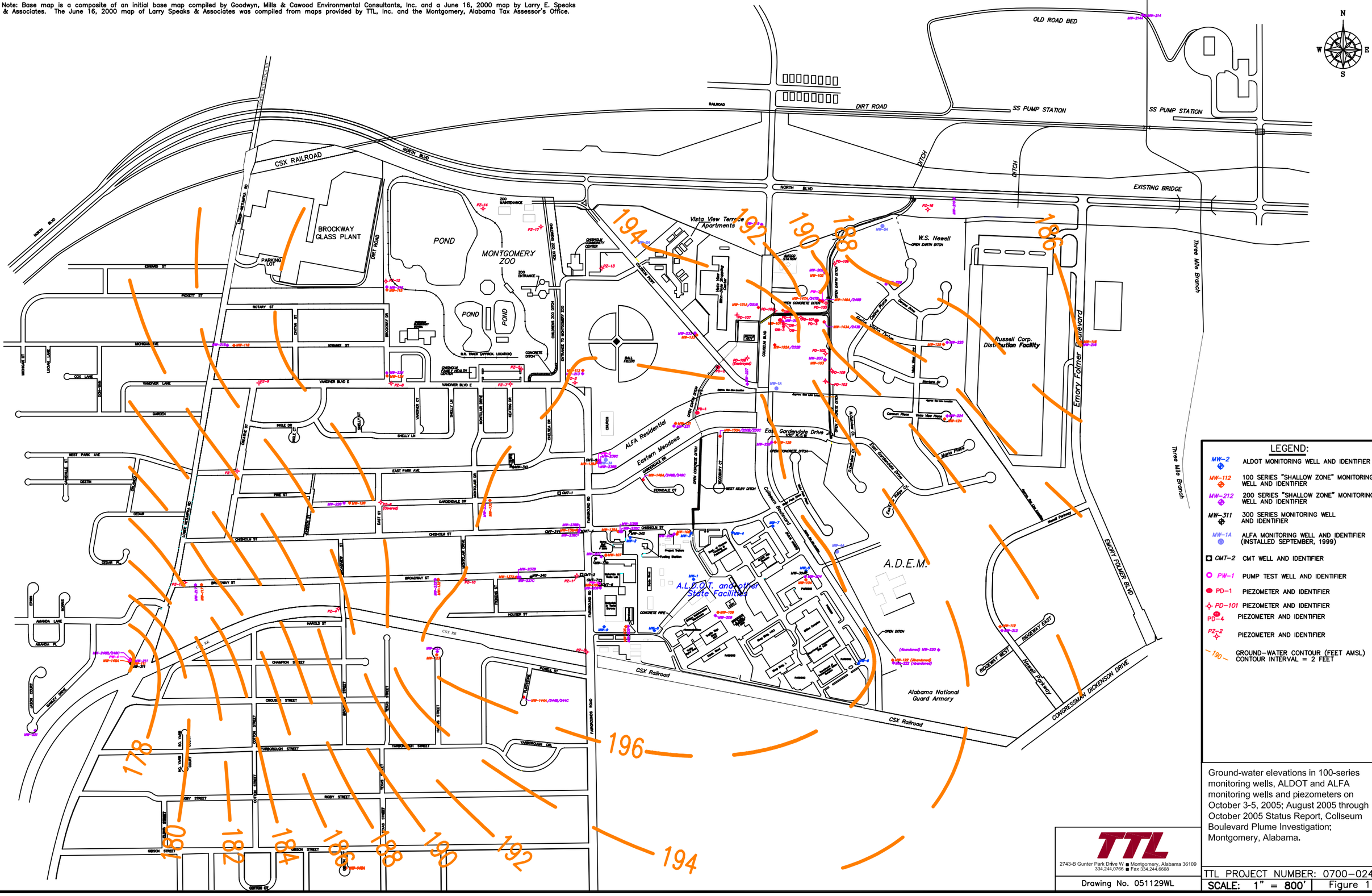
monitor for compliance with the Montgomery Water Works and Sanitary Sewer Board discharge requirements. The water samples were submitted for VOC analyses. Results of analyses of detected VOCs and volumes of treated water are provided in Table 13. Laboratory reports of the analytical results for samples collected are on the attached CD-R.

IV. Quality Assurance/Quality Control

- During the October 2005 quarterly ground-water sampling event, duplicate ground-water samples were collected from monitoring wells MW-102, MW-206, MW-218, MW-225, MW-228, MW-230, MW-233, MW-249B, MW-311, MW-340 and CMT wells CMT 2-2, CMT 3-2 and CMT 4-3 and analyzed for VOCs. The duplicate sample results are shown with the parent sample results (see Tables 3 and 6). The samples collected from monitoring well MW-249B was analyzed for inorganics (alkalinity, chloride, nitrate, nitrite, and sulfate) by **TTL** and dissolved gases (methane, ethane, and ethene) by STL. Ground-water samples also were collected from monitoring wells MW-113, MW-117, MW-201, MW-219, MW-226, MW-247B, MW-251B, CMT 1-1, CMT 1-5, CMT 2-5, CMT 3-4 and CMT 3-6 and shipped to **TTL**'s laboratory to be analyzed for total iron for quality assurance/quality control purposes (see Tables 4 and 7). Equipment rinse samples were collected and trip blank samples accompanied water samples that were submitted for analyses for VOCs in October 2005. Results of analyses of detected VOCs in the rinse and trip blank samples are provided in Table 14. Laboratory reports of the analyses are provided on the attached CD-R.

FIGURES

Note: Base map is a composite of an initial base map compiled by Goodwyn, Mills & Cawood Environmental Consultants, Inc. and a June 16, 2000 map by Larry E. Speaks & Associates. The June 16, 2000 map of Larry Speaks & Associates was compiled from maps provided by TTL, Inc. and the Montgomery, Alabama Tax Assessor's Office.



LEGEND:

- MW-2 — ALDOT MONITORING WELL AND IDENTIFIER
- MW-112 — 100 SERIES "SHALLOW ZONE" MONITORING WELL AND IDENTIFIER
- MW-212 — 200 SERIES "SHALLOW ZONE" MONITORING WELL AND IDENTIFIER
- MW-311 — 300 SERIES MONITORING WELL AND IDENTIFIER
- MW-1A — ALFA MONITORING WELL AND IDENTIFIER (INSTALLED SEPTEMBER, 1999)
- CMT-2 — CMT WELL AND IDENTIFIER
- PW-1 — PUMP TEST WELL AND IDENTIFIER
- PD-1 — PIEZOMETER AND IDENTIFIER
- PD-101 — PIEZOMETER AND IDENTIFIER
- PD-4 — PIEZOMETER AND IDENTIFIER
- PZ-2 — PIEZOMETER AND IDENTIFIER
- 190 — GROUND-WATER CONTOUR (FEET AMSL) CONTOUR INTERVAL = 2 FEET

Ground-water elevations in 100-series monitoring wells, ALDOT and ALFA monitoring wells and piezometers on October 3-5, 2005; August 2005 through October 2005 Status Report, Coliseum Boulevard Plume Investigation; Montgomery, Alabama.

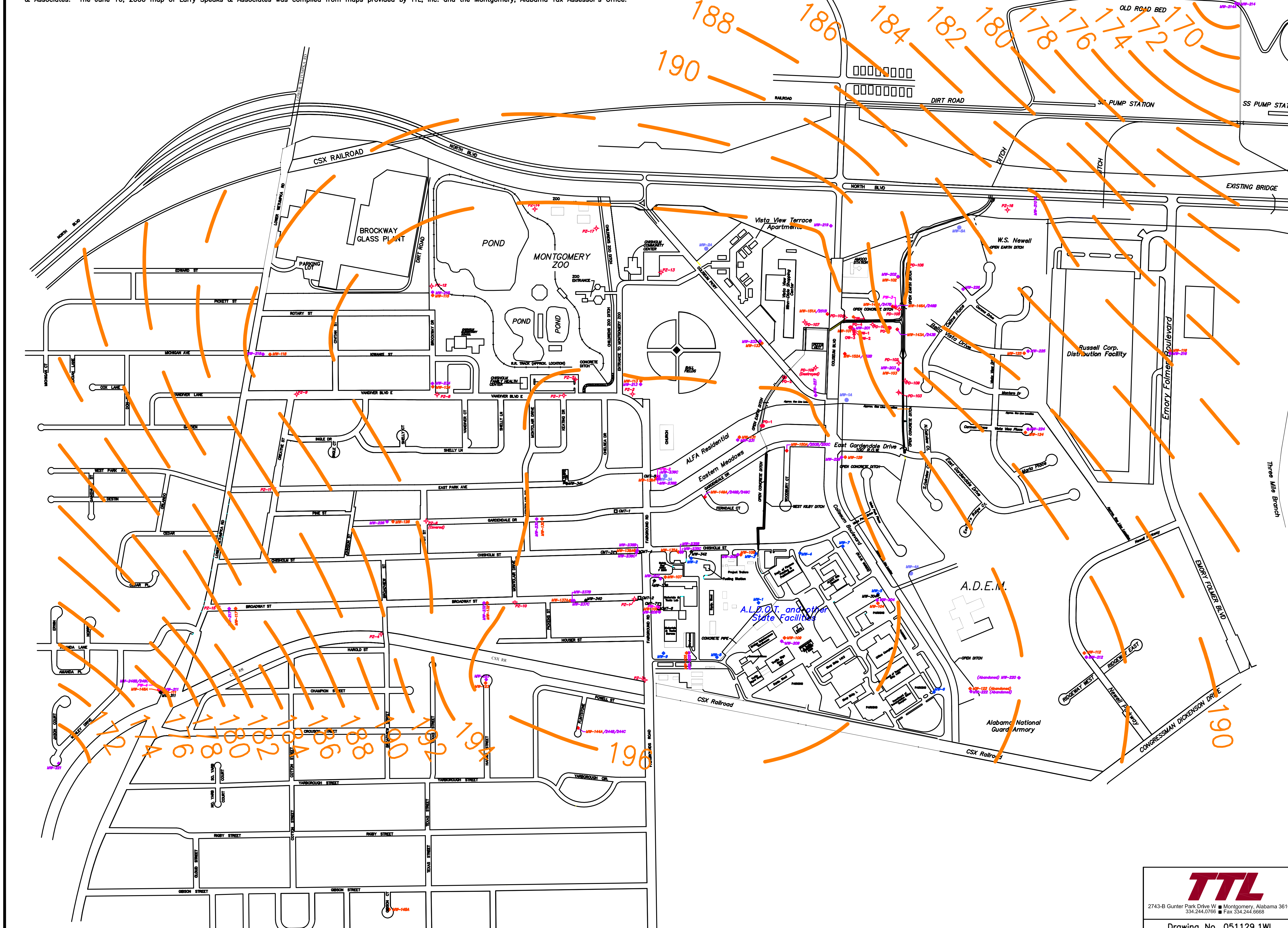
TTL
2743-B Gunter Park Drive W ■ Montgomery, Alabama 36109
334.244.0766 ■ Fax 334.244.6668

Drawing No. 051129WL

TTL PROJECT NUMBER: 0700-024

SCALE: 1" = 800' | Figure 1

Note: Base map is a composite of an initial base map compiled by Goodwyn, Mills & Cawood Environmental Consultants, Inc. and a June 16, 2000 map by Larry E. Speaks & Associates. The June 16, 2000 map of Larry Speaks & Associates was compiled from maps provided by TTL, Inc. and the Montgomery, Alabama Tax Assessor's Office.



LEGEND:

MW-2	ALDOT MONITORING WELL AND IDENTIFIER
MW-112	100 SERIES "SHALLOW ZONE" MONITORING WELL AND IDENTIFIER
MW-212	200 SERIES "SHALLOW ZONE" MONITORING WELL AND IDENTIFIER
MW-311	300 SERIES MONITORING WELL AND IDENTIFIER
MW-1A	ALFA MONITORING WELL AND IDENTIFIER (INSTALLED SEPTEMBER, 1999)
CMT-2	CMT WELL AND IDENTIFIER
PW-1	PUMP TEST WELL AND IDENTIFIER
PD-1	PIEZOMETER AND IDENTIFIER
PD-101	PIEZOMETER AND IDENTIFIER
PD-4	PIEZOMETER AND IDENTIFIER
PZ-2	PIEZOMETER AND IDENTIFIER
190	GROUND-WATER CONTOUR (FEET AMSL) CONTOUR INTERVAL = 2 FEET

Ground-water elevations in 200-series monitoring wells on October 3-5, 2005; August 2005 through October 2005 Status Report, Coliseum Boulevard Plume Investigation; Montgomery, Alabama.

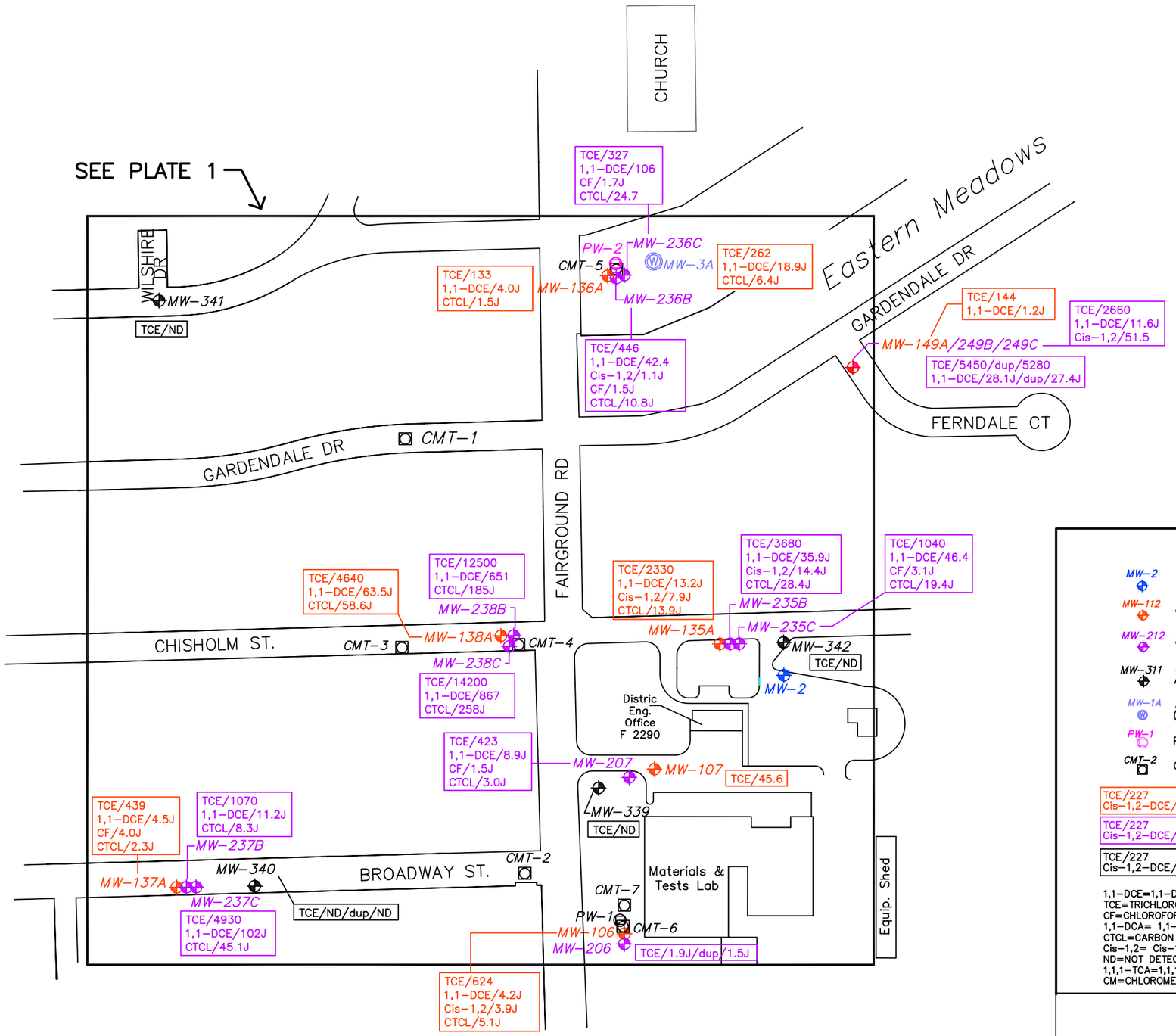
TTL
2743-B Gunter Park Drive W ■ Montgomery, Alabama 36109
334.244.0766 ■ Fax 334.244.6668

Drawing No. 051129.1WL

TTL PROJECT NUMBER: 0700-024

SCALE: 1" = 800'

Figure 2



LEGEND:

- MW-2 — ALDOT MONITORING WELL AND IDENTIFIER
- MW-112 — 100 SERIES "SHALLOW ZONE" MONITORING WELL AND IDENTIFIER
- MW-212 — 200 SERIES "SHALLOW ZONE" MONITORING WELL AND IDENTIFIER
- MW-311 — 300 SERIES MONITORING WELL AND IDENTIFIER
- MW-1A — ALFA MONITORING WELL AND IDENTIFIER (INSTALLED SEPTEMBER, 1999)
- PW-1 — PUMP TEST WELL AND IDENTIFIER
- CMT-2 — CMT WELL AND IDENTIFIER
- TCE/227 Cis-1,2-DCE/6.5 — VOC CONCENTRATION IN MICROGRAMS PER LITER (100 SERIES)
- TCE/227 Cis-1,2-DCE/6.5 — VOC CONCENTRATION IN MICROGRAMS PER LITER (200 SERIES)
- TCE/227 Cis-1,2-DCE/6.5 — VOC CONCENTRATION IN MICROGRAMS PER LITER (300 SERIES)

1,1-DCE=1,1-DICHLOROETHENE
TCE=TRICHLOROETHYLENE
CF=CHLOROFORM
1,1-DCA= 1,1-DICHLOROETHANE
CTCL=CARBON TETRACHLORIDE
Cis-1,2= Cis-1,2-DICHLOROETHENE
ND=NOT DETECTED
1,1,1-TCA=1,1,1-TRICHLOROETHANE
CM=CHLOROMETHANE

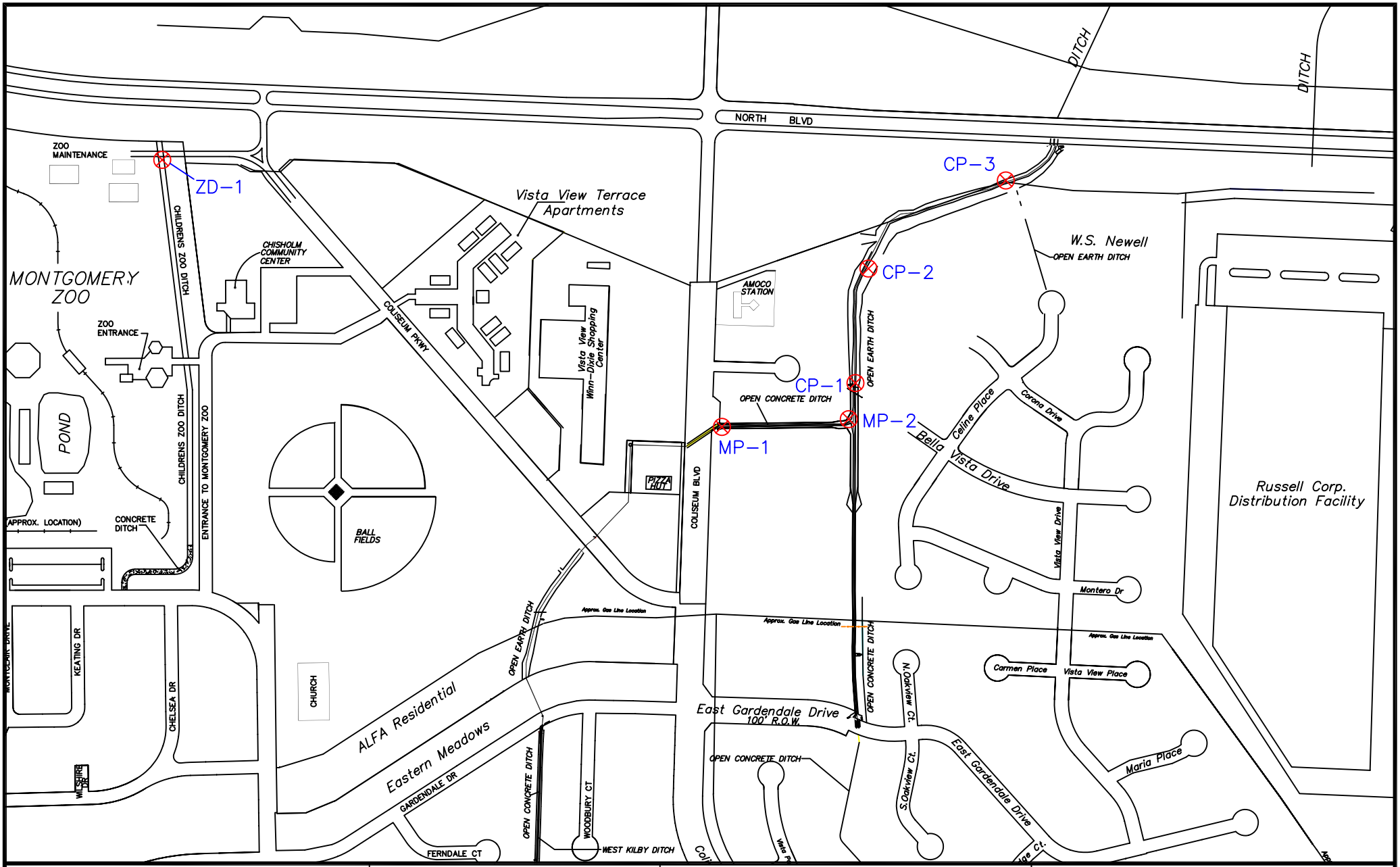
TTL
2743-B Gunter Park Drive W ■ Montgomery, Alabama 36109
334.244.0766 ■ Fax 334.244.6668

Concentrations of VOCs in ground-water samples from 100-, 200-and 300-series monitoring wells collected on October 3-25, 2005; August 2005 through October 2005 Status Report, Coliseum Boulevard Plume Investigation; Montgomery, Alabama.

TTL PROJECT NUMBER:0700-024

Drawing No. 051130.1

SCALE: 1" = 200' | Figure 3



TTL
2743-B Gunter Park Drive W ■ Montgomery, Alabama 36109
334.244.0766 ■ Fax 334.244.6668

LEGEND

⊗ SURFACE WATER SAMPLE AND IDENTIFIER

CP-1 KILBY DITCH COMPLIANCE POINT

MP-2 KILBY DITCH MONITORING POINT

ZD-1 ZOO DITCH MONITORING POINT

N

Coliseum Boulevard Plume
Alabama Department of Transportation
Montgomery, Alabama

Scale: 1" = 500'

Surface Water Location Points

FIGURE 4

OLD ROAD BED

DIRT ROAD

SS MANHOLE

SS MANHOLE

WASTE MANAGEMENT

ROW

DITCH

BLVD

EXISTING BRIDGE

TCE/ND

TCE/ND
TCEdup/ND

TCE/ND

W.S. Newell

OPEN EARTH DITCH

Corona Drive

Celina Place

Bella Vista Dr

Russell Corp.
Distribution Facility

Three Mile Branch

A B C D E F G H I J K L M N O P

N

LEGEND:

TCE/ND	TCE/concentration ug/kg Method Detection Limit (MDL)=3.0 micrograms per kilogram (ug/kg)
ND	Not Detected
dup	Duplicate Sample
TCE	Trichloroethylene

Boundary of Low Lying Area

M Sample location and Identifier

Approximate locations of intermittent streams

ALDOT Coliseum Boulevard Plume Investigation

TTL
2743-B Gunter Park Drive W ■ Montgomery, Alabama 36109
334.244.0766 ■ Fax 334.244.6668

Analytical results of sediment samples collected from Low-Lying Areas on October 27, 2005. Work Plan 04- Investigation of "Low-Lying Areas"; Coliseum Boulevard Plume; Montgomery, Alabama.

TTL PROJECT NUMBER:0700-024

Drawing No. 051129

SCALE: 1" = 300'

Figure 5

OLD ROAD BED

DIRT ROAD

SS MANHOLE

SS MANHOLE

WASTE MANAGEMENT

A

B

C

D

E

F

G

H

I

J

K

L

M

N

O

P

DITCH

T ROW

LVD

TCE/ND/dup/ND
Cis-1,2/3.3J/dup/2.8J

TCE/7.1J

TCE/9.8J

EXISTING BRIDGE

W.S. Newell

OPEN EARTH DITCH

Corona Drive

elina Place

Russell Corp.
Distribution Facility

Folmer Boulevard

Three Mile Branch

N

LEGEND:

TCE/ND	TCE/ concentration (ug/L) Method Detection Limit (MDL)=1.0 micro-grams per liter (ug/L)
J	Estimated (concentration below the pratical quantitation level, rather than the calibration curve values)
TCE	Trichloroethylene
Cis-1,2	Cis-1,2-Dichloroethene
ND	Not Detected

Boundary of Low Lying Area

M • Sample location and Identifier

Approximate locations of intermittent streams

ALDOT Coliseum Boulevard Plume Investigation

TTL
2743-B Gunter Park Drive W ■ Montgomery, Alabama 36109
334.244.0766 ■ Fax 334.244.6668

Analytical results of surficial water samples collected from Low-Lying Areas on October 27, 2005. Work plan 04- Investigation of "Low-Lying Areas"; Coliseum Boulevard Plume; Montgomery, Alabama.

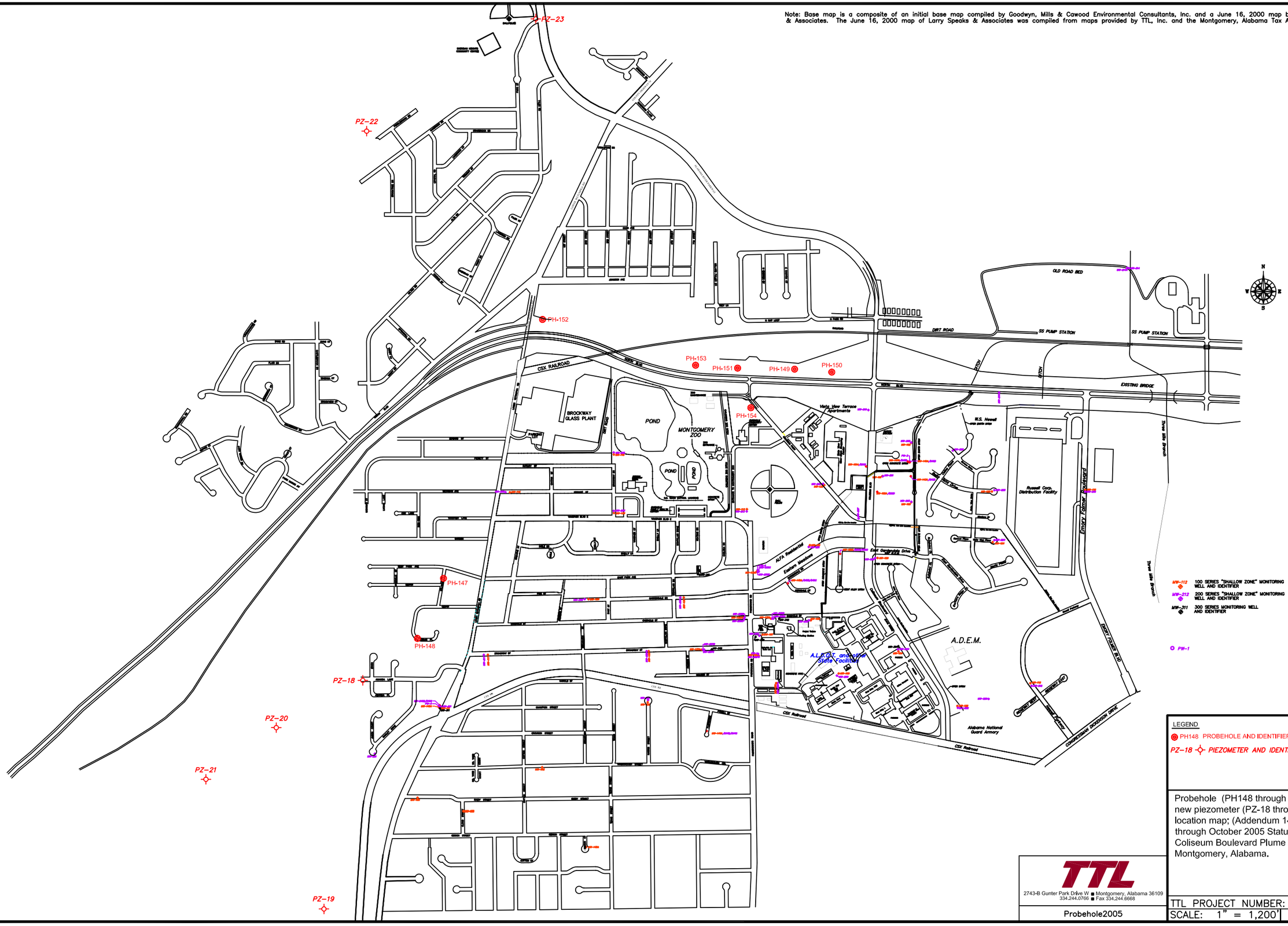
TTL PROJECT NUMBER:0700-024

Drawing No. 051129.1

SCALE: 1" = 300'

Figure 6

Note: Base map is a composite of an initial base map compiled by Goodwyn, Mills & Cawood Environmental Consultants, Inc. and a June 16, 2000 map by Larry E. Speaks & Associates. The June 16, 2000 map of Larry Speaks & Associates was compiled from maps provided by TTL, Inc. and the Montgomery, Alabama Tax Assessor's Office.



LEGEND

PH148 PROBEHOLE AND IDENTIFIER

PZ-18 PIEZOMETER AND IDENTIFIER

Probehole (PH148 through PH154) and new piezometer (PZ-18 through PZ-23) location map; (Addendum 14); August 2005 through October 2005 Status Report, Coliseum Boulevard Plume Investigation; Montgomery, Alabama.

TTL
2743-B Gunter Park Drive W ■ Montgomery, Alabama 36109
334.244.0766 ■ Fax 334.244.6668

Probehole2005

TTL PROJECT NUMBER: 0700-024

SCALE: 1" = 1,200' Figure 7